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Office of the
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DISCUSSION PAPER NO. 66

ONE PACHYDERM SHIFT AFTER ANOTHER

CHANGING PARADIGMS AND
RE-ENGINEERING THE AUDIT PROFESSION

BY D. LARRY MEYERS, F.C.A.
JUNE 1992



DISCUSSION PAPER SERIES

DOCUMENTS DE DISCUSSION

The attached paper has been prepared to stimulate thought and discussion regarding our audit activities. The views expressed are those of the author and therefore should not be construed as those of the Office.

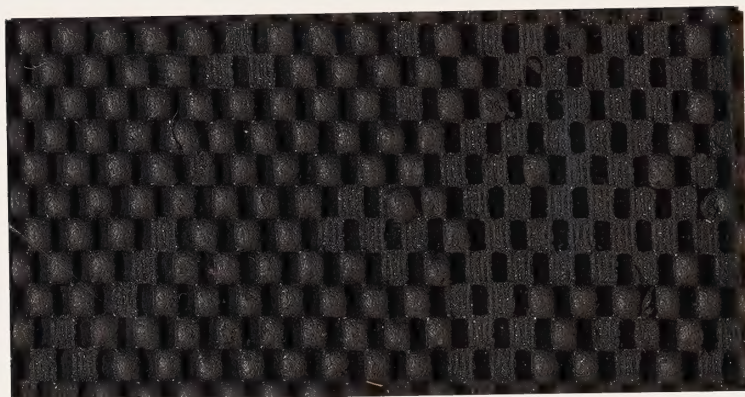
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**BY D. LARRY MEYERS, F.C.A.
JUNE 1992**

**Notes for an address to the
The Canadian Conference on Auditing and Computer Technology
April 1, 1992**

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CHANGING PARADIGMS AND RE-ENGINEERING THE AUDIT PROFESSION

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I. INTRODUCTION

As we approach the twenty-first century, the audit profession faces a crisis, **risk** mixed with **opportunity**. The **risk** comes from changes in the environment in which the audit profession operates, changes which are so rapid that the gap between expectations and professional practice steadily grows larger. Many of these changes in the auditor's environment are the result of technology. The **opportunity** comes from the technology which allows us, not only to execute existing processes faster, cheaper and better, but to re-engineer those processes in ways not possible without the technology.

These changes are not simply linear extrapolations from where we are now. Rather, these changes represent a "paradigm shift", a re-structuring of how we see our society and our profession.

Now, I do appreciate that the expression "paradigm shift" is a **very** overworked one, used to mean everything from global changes through to changes of minor significance.

For example, an auditor down in Texas was seriously injured recently while doing an audit of a major metropolitan zoo. It seems he was taking inventory of the zoo animals just before feeding time.

The elephant keeper didn't realize that the auditor was doing substantive tests in the cage - he was counting the elephants, I believe - and threw the elephant's food into the usual place. One large elephant turned quickly to get her share first, knocked the auditor down and stepped on him accidentally.

In the ambulance en route to the hospital, the auditor compared his experience in the cage with developments in his profession. "Its all the same," he observed sadly, "one pachyderm shift after another."

It is April Fool's Day today. Perhaps our auditor wasn't that far out. One person's pachyderm shift may be another one's paradigm shift. Both are big in size and big in consequence. We may joke about the misuse of the word or about the way that the expression "paradigm shift" is overused. But the joke will be on us as auditors if we do not recognize the enormous significance of the changes going on all around us.

In 1982, John Naisbitt documented major societal trends of a decade ago in his bestselling book, "MEGATRENDS". His concluding sentence describes his view of the early 1980's, and I quote:

"My God, what a fantastic time to be alive!"

Naisbitt discussed structural changes as he then saw them. But there is nothing in his book to compare, for example, with the breakup of the Soviet Union which we have

just seen. Indeed, compared to the last couple of years, the early 1980's about which he was writing were static and boring!

Indeed, there is a wave coming in - a wave of change driven by technology. It is a wave which, like the auditor's elephant, cannot be resisted - at most, we can only control its direction and impact a little!

This morning, I would like to explore with you some of the most significant changes in the environment in which auditors work, including, among other things, changes in technology. Then I will comment on the past record and future plans of the government, and on the impact of technology in the Office of the Auditor General of Canada. I will then look ahead at the impact of this environment on our profession.

II. The RAPIDLY CHANGING ENVIRONMENT

Charles Dickens opened his classic novel, *A Tale of Two Cities*, with the line:

"It was the best of times, it was the worst of times."

The context for the opening of this novel, pre-revolutionary France, is interesting for us today. Some historians believe that in 1788, half of the revenue of the King of France went to pay interest on his debts. Today, governments and corporations alike are feeling the effects of being over-extended, although perhaps they are not quite so over-extended as he was.

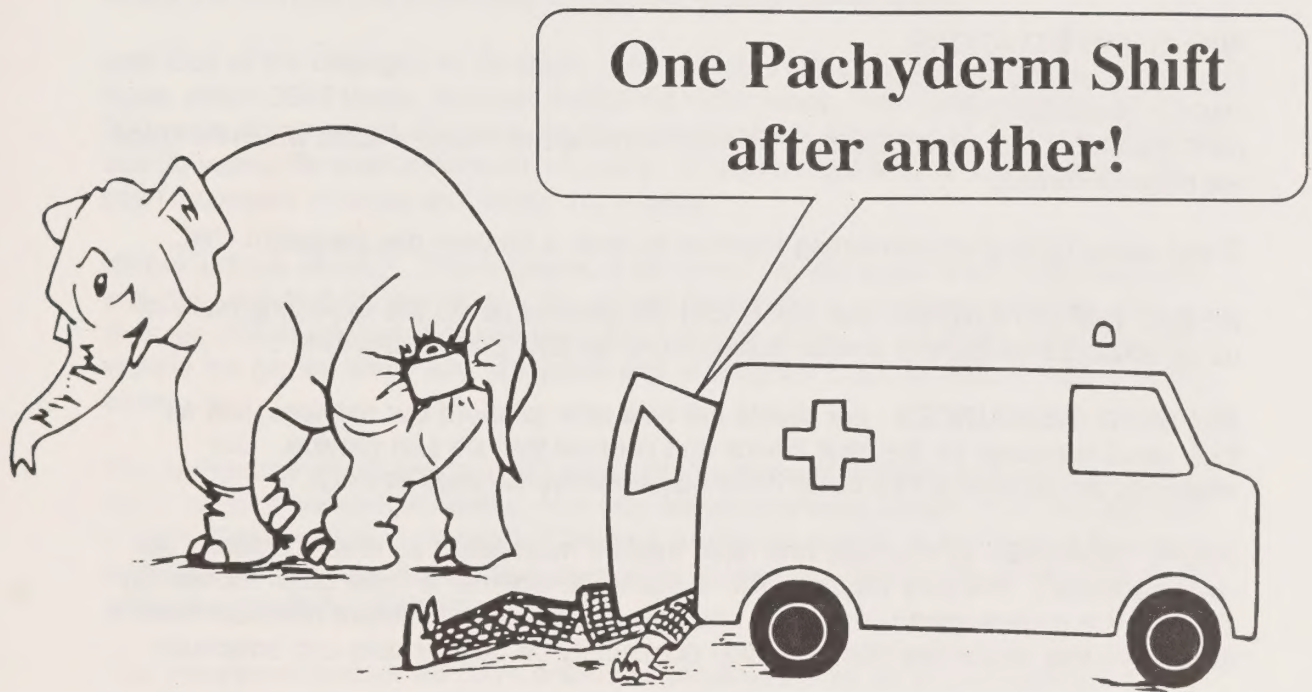
The high level of intense political debate in pre-revolutionary France was facilitated by a revolution in information technology.

People frequently compare the current revolution in computer technology with the development of the printing press with movable type in the fifteenth century.

This may be an over-simplified view of history.

Before the invention of the printing press with moveable type, the largest library in Europe had about one thousand manuscript volumes. A hundred years later, the largest library in Europe had ONLY four thousand volumes, one thousand of which were still handwritten manuscripts. Libraries of more than five hundred volumes were rare for another century.

Publication costs were still much too high for all but the very rich.



The full impact of this new printing technology was not realized until it was associated with new and much cheaper methods for book binding, an early application to publications of the methods of mass production.¹

The real benefits of a change in technology were not realized until they had been exploited by a corresponding change in methodology. It was this revolution in printing technology and methodology which made possible the relatively broad and speedy distribution of the political treatises which provided the intellectual fuel for both the American and French Revolutions, just as television is doing it now.

So whatever the details of the Sun King's financial and other problems were, he faced a situation shift in which the

RISING EXPECTATIONS,
REDUCED RESOURCES,
RAPID CHANGE and
INFORMATION TECHNOLOGY of his time combined to create a force which he could not hope to control.

These same factors are combining together to force a modern day paradigm shift.

RISING EXPECTATIONS - our clients and the general public are expecting more of us as auditors and there is a wide perception of an **EXPECTATION GAP**.

REDUCED RESOURCES - our clients are less able to afford our services, just as their need increases for the best advice and counsel that we can provide. Our challenge as auditors is to provide more cost-effective services to them.

RAPID CHANGE - so dramatic and rapid that we must see it as revolutionizing our own profession. The new way in which things work together is most often technology driven. The current speed of change and the uncertainty of its future direction make it imperative that responses from the audit community be both flexible and adaptable.

INFORMATION TECHNOLOGY - has spread so broadly that most office workers and many homes have acquired computers in less than a decade. Information technology has changed more in a decade than automobile technology changed in nearly a century.

I am focusing on auditing and computer technology, but before getting into the specifics of the changes in our technological environment, I'd like to draw your attention to other environments which are changing and which will have significant impact on our work as auditors.

¹ From Geoffrey James, *Database Publishing*, New York: Van Nostrand Reinhold, 1985.

A. Grey Power - The New Demographic Environment

The Bible talks of an expected life span of three score and ten years, but two thousand years ago, few people lived longer than thirty years. By the end of the Middle Ages, the average life span had reached thirty-eight. A person born in 1900 in the USA could anticipate 47.3 years.

From 1960 to 1990, the average life span for humans has increased one-half year each year for the last thirty years. This has been true for the both the industrial world, where lifespan has increased from about 62 years to 77 years and for the third world where the lifespan has increased from about 45 years to 60 years.

Lets look at the **changes** in life span. From Biblical times to the end of the Middle Ages, about 2000 years, life span increased eight years. From then to 1990, about 300 years, it increased 12 years. In the next 60 years, it increased 12 years and in the last 30 years, life span increased 15 years. In shorter and shorter time periods, life span increases in larger and larger increments.

Where will this all end? There seems to be some genetic code which metaphorically tells the body that its time is up. So, except for accidents and serious illness, our lifetimes should approach closer and closer to 120 years. In addition, someone might identify the genes which say 120 years and re-program them for 200 or 500 or 1000 years.

The technology which has brought about this increase in lifespan has also brought about an improvement in health. Not only are people living longer, they are healthier in their "Golden Years." Instead of being a burden to society at this time of their lives, older people are now more active, physically as well as intellectually, than were their predecessors thirty years ago.

This increased lifespan will have enormous implications for all of our society. In personal terms, for example, my daughter wishes to be a doctor specializing in obstetrics, but I've been telling her that the rebirth of our nation is in its seniors. The way to fame and fortune for a doctor now is probably geriatrics not obstetrics. In professional terms, we are providing opinions on the actuarial liabilities of pension funds. (Our assessment of the actuarial liability of the Superannuation Account was recently increased over \$2 billion.) This has been possible because lifespan has changed so slowly that the statistical base for our opinion could be based upon actual statistics. Lifespan is now increasing so fast that we may have to base our opinion, not on the last information on how long people have lived, but on our estimate of how fast lifespan is increasing.

We are now facing a rather peculiar situation. We are writing-off a group of people, many highly skilled, with a significant life expectancy and an intense psychological need to continue to contribute, from a society of stable or even diminishing resources which is not totally reproducing itself. We will have to re-engineer our approach to the

integration of seniors into our society. The emergence of "grey power" is just beginning.

B. The New Politics

Most of us here today have lived our adult lives and many of you have lived your entire lives in the shadow of the Cold War, now mercifully over. The way the Cold War ended points out the same significant issues which affect our audit community.

It ended largely because its costs were no longer affordable. It ended quickly, one might say abruptly. After years of almost futile negotiations involving modest concessions, it was suddenly over. And the technology of communication had spread so widely that the U.S.S.R. Central Government could not contain knowledge of how the economy was faring.

C. Boom and Bust Economics

This may not be the worst of times but it is certainly not the best of times. It is perhaps an overstatement to say that we have just lived through the most prosperous period in the world's history, but the stark reality of the economy of the 1990's is that we must do more for less in all sectors, private and public. The resource levels to which both corporations and governments have become accustomed are simply no longer available.

The economic environment must now be viewed in global terms in that national governments and firms have much more limited opportunities to control and manage economic affairs than previously. Businesses are restructuring to deal with world-wide competition.

Organizations are flattening and re-focusing on core competencies - doing only what they do very well.

Organizations are increasingly treating data and information as key corporate resources and managing them corporately.

D. Green Power

The relationship between technology and the environment is multi-faceted. Technology aids in the detection of pollution and the monitoring of its abatement. On the other hand, some high-tech operations, including some military ones, are very serious polluters.

The move towards the paperless society, which EDP technology facilitates, has the potential for preserving forests and reducing garbage.

Interest in environmental accounting has been rising in past years and this interest will increase.

One of the problems of environmental assessment and environmental auditing has been the absence of readily available data bases of environmental information. Hundreds of laws from different governments and overlapping legal jurisdictions require sophisticated data base expertise just to track the myriad of laws. Action plans, disaster recovery and quick responses require information to be readily available to meet urgent needs anywhere in the country.

E. Getting Sued - The New Legal Environment

Americans appear to have the most litigious society in the world and Canada is becoming increasingly so. Most of the large public accounting firms are finding themselves in legal actions brought about by persons or organizations who, while not clients, perceived themselves as injured as a result of actions taken following their acceptance of an auditor's opinion.

In this respect, the expectation gap, of which I am sure you are all aware, turns for this profession from bark to bite.

F. Total Quality Management

American industry for years assumed that a 5% error factor was acceptable to the public - and built up systems of statistical sampling to test products, and expected customers to live with errors that large. The Japanese didn't accept this - and developed TQM - Total Quality Management. Today, society is moving from accepting 5% of goods or services which won't meet spec, to demanding ZERO DEFECTS.

The challenge to auditors is that a 95% assurance of detecting a material error in a statement won't be seen by the courts as good enough if an error is discovered after the audit. Part of the answer to this challenge is communication - communicating what audit assurance really means - not more than nor less than.

Part of the answer to this challenge is technology. Technology can help by providing more reliable systems, better audit evidence and, in some circumstances, testing of 100% of transactions. Developments in electronic data interchange (EDI) will become very important here in that all transactions will become electronically accessible to the auditor.

G. Revolution in Technology

To a large extent, the way we manage technology will determine how effective we are in meeting the information needs of this country in the future. Auditing is an

information driven process. We as auditors will be turning more and more to technology to provide the cheaper and better results which our clients need.

But most important, the current rate of technological improvement is more likely to continue to increase rather than to slow down. There is no technological plateau in sight.

III. TECHNOLOGY FOR AUDITORS

There is little that I can add to what James Martin said Monday about the rapidly evolving technologies which we see being deployed. Let me just put some of this information into the perspective of auditors.

There are three areas which seem particularly important to me:

POWER TO THE PEOPLE

BUILDING BLOCK SYSTEMS and

the MEDIUM IS THE MESSAGE.

A. Power to the People

One change is the move of computing power from the computer room to the user.

1. Intelligent Workstations

The movement of computing power from mainframe computers to the desktop is a phenomenon so well known to all of you that it hardly needs comment. We have become accustomed to have personally the computing power of mainframes of the 1970's on our desk tops - the power of mainframes of the 1980's is now available and at affordable prices. The execution of tasks of enormous complexity are now within our grasp and under our personal control.

2. Making Power Portable

The move of computing power to the user's desk top has a twist of particular importance to auditors - computers got lighter and more portable even as they were getting faster. These more powerful computers are being equipped with software and hardware accessories which make them the desktop of the user, which itself is portable. To professionals who move through a series of work sites, as do auditors, these portable computers have revolutionized their work processes.

3. User Friendly Software

What made the personal computer really fly was the development of some useful user-friendly software to do spreadsheets, data bases and word processing. These application programs that hide behind some simple menu item give computer neophytes productivity enhancing tools.

Not all auditors have appreciated the significance of this. A product like I.D.E.A. is not just an easy way of setting up CAAT's - it provides an easy means of modifying the audit process if initial audit results suggest other approaches would be more appropriate. At the same time, the user friendly character of software can reduce the quality control that a more centrally controlled system would ensure.

4. Electronic Togetherness

Another change is the increasing use of networks.

The personal computer, portable or on the desktop, in freeing us from the constraints of mainframe computers, cut off one powerful feature of mainframes - connectivity. Broadly defined, connectivity is the means by which we exchange information electronically among ourselves and contribute to shared tasks.

The wider use of networks is restoring that loss while maintaining the independence of the personal computer. Using modems, auditors can file electronic reports from remote locations to speed the development of organization-wide summaries against which the financial statements can be verified.

5. Risks and Benefits

The move from mainframe to personal computer increased the risk of the loss of control that the traditionally well disciplined central computer group gave to systems. A spreadsheet program is a powerful tool but it is as capable of producing false results, due to user error, as it is of facilitating good analysis.

The big benefit from providing power to the people came from the increased creativity which the new computing environment inspired and from the enormous productivity gains which followed.

B. Building Block Systems

In parallel to POWER TO THE PEOPLE, we may now more easily and cheaply build systems from BUILDING BLOCK -like modules of hardware and software.

1. Open Systems Architecture

One of the most promising technological changes is the emergence of open systems architecture and the development of a multitude of products and vendors.

Historically, all systems were proprietary and all hardware and most software system components came from one vendor. Systems are now routinely built of hardware components from a variety of vendors with software from a number of suppliers who may or may not also be hardware vendors.

Open systems technology provides us with:

- Greater flexibility to store and access information;
- Faster response to changing conditions;
- Protection from obsolescence;
- Better cost control;
- Reduced investment risk; and
- Faster, more efficient decision-making through a massive improvement in networking ability.

2. Sophisticated Computer Systems

While the emergence of the personal computer may have grabbed the lime-light in recent years, we must also focus on the bigger picture. The power of mainframe and mini computers has also increased enormously. Open systems architecture, through whose application all computers have some compatibility, makes possible the design and implementation of very complex systems where processing and data storage are distributed among many different computers.

As auditors, we should be insisting that in the design and implementation of such systems, measures be taken to ensure their audibility in respect to appropriate levels of assurance and reasonable audit cost.

As audit professionals, we face potential audit risks as client dependence grows on these increasingly complex systems.

3. Electronic Data Interchange (EDI)

Just as electronic and paperless transaction processes are developing inside an organization, EDI permits the introduction of electronic and paperless transactions among audit entities, including entities clearly operating at arm's length. Providing

audit assurance for such transactions is a task of increasing significance and sophistication.

Auditors must ensure, without the traditional paper trail, that they have a complete and accurate set of transactions, held in a stable fashion, that is, so that they can not be accidentally or intentionally altered.

C. The Medium As Message - MultiMedia

Recent research has shown that reading text is a much different process than watching a video EVEN IF THE CONTENT IS THE SAME. The written text is processed by the left brain, the hemisphere of the brain which is logical and analytical, while the video is processed emotionally and uncritically by the right brain.

Viewed from this perspective, we should not therefore be surprised that the carefully worded and beautifully published reports which characterize our profession do NOT always produce the commitment to action for which we as auditors might have hoped.

This is complex and important matter, worthy of a conference in its own right and I am not attempting to do justice to it here. The message that I do wish to leave with you is that the technology is in hand to produce communication material of types whose functions and powers we do not yet fully understand. The use of multi-media documents, where the written word is used to carry logical and rigorous messages and where sound and video are used to elicit commitment to action, may permit the development of training materials of extraordinary capability.

D. Summary of the New Environment

The forces driving this new environment and forcing a paradigm shift, while stronger now, have been at play for some time. I would like to take a few minutes now to talk about what is happening in my client, the Government of Canada, and in my office, the Office of the Auditor General of Canada.

IV. The GOVERNMENT OF CANADA

The Government of Canada is a LARGE and UNIQUE CLIENT. It is the largest audit entity in Canada and indeed, one of the largest in the world, since other countries do not produce audited summary financial statements. In Fiscal Year 1990-91, it had expenditures of \$150 billion, revenues of \$119 billion, leading to a deficit of about \$30 billion. At the end of that year, its liabilities totalled \$434 billion.

A. Government Use of Information Technology

The Government of Canada now owns over 200,000 workstations, largely personal computers, and over 500 mini and mainframe computers. The Treasury Board

Secretariat states that annual expenditures on Information Technology are currently \$3 billion and are growing by 12 per cent annually. Unfortunately, much of this money goes toward operating and maintaining aging systems designed to automate clerical operations rather than provide enhanced service to the public.

The current resource "crunch" means that government, like other organizations, must find ways to become more efficient and effective. Of all the tools available to government, information technology has the potential to be the single most important contributor to improved efficiency and value-for-money.

Notwithstanding, progress in using information technology has been painfully slow.

Our 1987 Financial Management and Control Study found that of the systems studied, about 1/3 had been abandoned, almost all were over budget and all were late.

In the 1989 Telecommunications Audit, we saw little central planning and direction in a function costing a billion dollars per year.

Our 1990 Information Security audit found that departments generally did not have contingency plans and had done little in the area of threat and risk assessment.

B. The Future of Information Technology in Government

However, there are signs that the government is recognizing the potential of technology.

The challenge ahead for the government is to direct its investment in technology and its use of information such as to enhance service to the public, improve program delivery, increase productivity, revitalize the Public Service and support Canadian industrial competitiveness.

To meet the challenge of the future, Treasury Board has embarked on a pro-active campaign to promote five key strategies with departments.

1. Improve government programs and services as well as increase productivity by restructuring operations to take advantage of information technology.
2. Invest in technologies which have government-wide benefits to avoid duplication by sharing both costs and benefits with other organizations.
3. Exploit the strengths of other organizations and establish profitable partnerships to enhance services where new technologies could best provide opportunities for system improvement.
4. Build an open architecture for its information technology and protect information assets and intellectual property.

5. Ensure that government managers and staff are able to use information technology to increase their productivity.

In response to the Treasury Board initiatives, departments are devoting much attention and resources to determine where new technologies could provide benefits. These range from Electronic Data Interchange, Electronic Signature, Imaging, application of Smart Cards, Open Architecture concepts and emerging CASE tools. All of these offer promises of improvement but the real challenge for departments is to re-visit stakeholder needs and re-think the processes to achieve efficiencies and better effectiveness.

Without providing absolute guarantees, these initiatives indicate the government is serious about using information technology to make the federal service more responsive and productive.

C. The Future of Auditing in Government

In an address to the Canadian Comprehensive Audit Foundation, Andy MacDonald, Comptroller General of Canada, recently explored how we can benefit from change through new opportunities, which in turn can create value for our clients and rewards for ourselves. Two of the issues he raised were:

- Given that change is currently all around us, do we lead the change process, or, do we only reluctantly respond to change?
- Given that change can create risks or opportunities, how can and how have clients, managers and practitioners seized the opportunities by developing shared innovative agendas to lead the change process?

"If we can successfully deal with these issues," Andy MacDonald maintained, "our reward will be continued relevance."²

One of our Office's answers to this challenge is to review the technology plans of government with a view to encouraging the growth of technology in government. In this study we hope to highlight cases in which departments and agencies have applied information technology in an innovative manner.

Under this new approach, we will play down criticism of failures and look for opportunities - recognize those who successfully exploit them.

² Quotation from the February 1992 Update Bulletin of the CCAF which reported on the Conference.

V. IMPACT AND USE OF INFORMATION TECHNOLOGY IN OAG

Over the last 15 years, computer auditing in the OAG has changed direction and evolved dramatically. Influences on computer auditing have included: strong senior management interest and support; pressures to reduce audit cost; our comprehensive auditing experience; and the explosion of technology opportunities, in particular, the introduction of personal computers (PC's).

The Office has made a significant long term commitment to information technology for using and auditing computer systems. All audit staff have access to microcomputers; in fact we have reached our goal of having as many computers as permanent staff. We have also been active in the development of audit software for PC's during this time. Innovative software for data extraction and analysis and for the creation and management of electronic working paper files has been conceived in the office.

The Office maintains close contacts with the technology industry as well as our private sector auditing colleagues. In addition to exploring common concerns, we have entered into several personnel and project exchange arrangements. In this way we feel we can improve our own information strategies as well as our understanding of the pressures, trends and norms that our audit clients are subject to.

A. Where did we start?

In the mid 70's , we established the Computer Audit Group by arranging with private sector firms for 2 year executive interchanges to obtain the services of individuals with the necessary background until we could recruit permanent staff. This approach enabled the core operation to get up and running in a short period of time.

We staffed the group with a combination of auditors with interest in computer auditing and programmers.

B. Training of Auditors

After the Computer Audit Group was firmly established, a training program in EDP audit skills was implemented for general auditors. The program required auditors, under the supervision of EDP auditors, to prepare EDP environmental planning surveys, application reviews and CAATs for their audits and for other audit teams.

As I have already noted, not all auditors have appreciated the significance of this. A product like I.D.E.A. is not just an easy way of setting up CAAT's - it provides an easy means of modifying the audit process if initial audit results suggest other approaches would be more appropriate. At the same time, the user friendly character of software can reduce the quality control that a more centrally controlled system would ensure.

Many of these auditors have remained with the Office and are now in middle management positions in the audit groups. Their presence is continuing to have a

major impact on the Office. It has helped bring about changes in audit approaches that often involve innovative use of information technology.

C. The Move to a Substantive or Data-based Approach

We learned through experience that security and control evaluations were costly. Weaknesses were difficult to substantiate without concrete examples of loss. Without specific examples of error, we found it hard to convince Parliament or management to correct the problems and face up to the potential risks. Since reliance on systems was rarely cost effective, a new substantive approach evolved in the early 1980's. This approach, previously called "transaction-based auditing", was well suited to the computer, as by that time virtually all significant accounting records were being maintained on computer systems with nine track removable magnetic tape drives.

CAATs were so cost-effective that, for several years, the Office built a battery of computer programs, or CAATs to sample and total the larger systems data, particularly the expenditures. Audit costs dropped rapidly.

D. Mainframe bottlenecks

The demand for the services of the Computer Audit Group continued to increase as our general audit staff became familiar with the benefits of using CAATs.

As a result, the backlog of work increased to the point where six weeks or more of elapsed time was the norm between a request for a new CAAT and receipt of the first output. Then, after reviewing the output, the audit team would often change its specifications and the cycle would begin again. It became clear that we had to decentralize the activity and put the data and the tools directly in the hands of auditors.

E. Getting the Data to the Auditor

The largest single event related to audit tools and techniques in the past ten years has been the introduction of hard disk based personal computers. Financial data can be downloaded onto personal computers and examined by the audit teams themselves using appropriate software.

The audit team waits only seconds, instead of weeks, for inquiries into the client database. Consequently, we have now moved approximately 75 percent of the CAAT workload away from the Computer Audit Group.

I.D.E.A. (Interactive Data Extraction and Analysis), conceived by the Office in the mid 1980's, was the primary tool used for PC-based CAAT work. This menu-based micro software allowed the team to total, sample, analyze and explore the data. The most significant breakthrough for auditors was that they now came into total control of their own client data. They could see each and every transaction on screen on their own personal computers.

I.D.E.A. has now evolved into a commercial product developed and marketed in Canada by the Canadian Institute of Chartered Accountants. The most recent version, 4.0, is now able to read directly from nine track tape and is faster, more powerful and easier to use. As partners with the CICA we are continuing to further refine and develop I.D.E.A. for our mutual benefit.

F. The Electronic Audit Briefcase

The Office realized that a more structured and comprehensive look at the automation of the audit needed to be undertaken. The concept was to provide auditors with the tools, in the form of a portable electronic briefcase, to perform efficient audits. Our long-term goal is to eliminate paper. Rather than briefcases full of paper files we see the computer as the briefcase. More and more of our working papers are now in electronic format.

From the preparation of the audit plan through to the briefing material used by the Auditor General in the Public Accounts Committee meetings, all phases of the audit process use information technology.

Our strategic policy for information technology is "to empower the auditor". We consider the auditor to be a professional who must have full access to a flexible and powerful computer. This computer should be equipped with a selection of general and audit software. It must be a portable computer to facilitate use at the client site as well as in the Office and at home. In addition, other task-specific computers can be shared when unusually large memory and fast CPU are required.

A major development, and the foundation of our electronic briefcase, is **AuditPro**. Based on audit programs for attest audits and tables of contents for value for money audits, AuditPro allows the linking, indexing and organizing of audit documentation electronically. It provides a way of filing word-processed interview notes, draft reports, spreadsheet schedules and flowcharts. It also provides features for review of audit files.

The Office has generally approached the acquisition of software by adapting readily available commercial packages to audit use. Besides I.D.E.A. and AuditPro, our electronic briefcase includes commercially available word processors, spreadsheet packages, a leadsheet package and a graphics package for presentations. We also worked with developers to produce electronic mail and flowcharting packages to meet our needs.

G. OAG Audit Database

The Office of the Auditor General also wanted to address the need to store, retrieve and analyze the textual data that comprises more than 80% of what the audit team studies in its work. The vast numbers of documents that are needed showed a need for networking larger hard disks for volatile data and optical disks or CD-ROM disks for reference material.

An initiative was started internationally by the Auditor General to get other countries, institutes and public institutions to consider producing material electronically in some standard way so that we could share it efficiently. In order to demonstrate the power of the concept, the Office undertook a project to gather together all the electronic material relevant to public sector auditing that could be obtained reasonably. In return for sending the OAG their material, contributing institutions would receive a copy of the database.

The OAG has produced a CD-ROM containing reports, manuals, pronouncements and extracts from audit and accounting material contributed from six countries. (The participating countries include: Australia, France, Great Britain, New Zealand, Sweden and the United States.) Combined with our text retrieval software, it allows us to access over 200,000 pages of text including the CICA Handbook, our audit manuals, guides and other countries' published reports.

This CD-ROM is used to explore what others have done and how they have approached and reported on various audit issues and subject areas relevant to public sector auditing work. The OAG Audit Database continues to grow as various countries and professional institutes become able to publish electronically as well as on paper. This year we are adding all the electronically available information from our provincial counterparts.

H. Financial Management System

The Office of the Auditor General is also developing its own fully integrated, on-line, real-time financial and operational management system based on open system architecture on a mini-computer. It handles timesheets, cost details, contract administration, planning and tracking, materiel management, personnel, travel and financial statements of the Office. The use of an electronic approval system eliminates paper and facilitates the processing of these transactions. Future modules will incorporate professional development, corporate filing and annual report writing and on-line access to the OAG Audit Database.

All office staff are now connected to the mini-computer with their laptops through local area networks or modems and can view information in summary, detailed or in graphic formats. Our regional management and other travelling staff can dial into the system using regular telephone lines.

I. Constraints to Implementation

As with any changes in work habits and styles, there was and still is some resistance to the implementation of the technology. There was considerable reluctance, particularly among the more senior auditors and managers, to acquiring and using keyboard skills. Years of passing typing work to typists had engendered perceptions of what was and what was not appropriate work for professionals. However, those with a vision of the future were easily convinced to invest time in learning the technology. Training is a continuous process, often starting with formal training and continuing with reading, on-the-job experience and help from colleagues.

The difficulty is that a critical mass of users is required before the benefits are really achieved.

Early innovators must learn to apply the technology first, and then pass on the information to the classroom trainers and the auditors or evaluators. Not all staff will be comfortable and the change will be gradual. A recent study in the office has found that 90 percent of staff cited the changes in audit procedures as positive. The remaining 10% will require more time to adjust. The trick is to stay slightly ahead of the keeners so they don't go out and develop their own solutions, but not to move so fast as to lose the majority of the user population. Establishing pilot groups may facilitate managing the implementation of technology.

The extent to which the leaders demonstrate the benefits determines the rate of penetration of use. Rewarding the innovators publicly and providing forums for discussing applications often provides invaluable encouragement for the rest of the staff to invest personal effort.

To sell senior management on technology, it is important to select an easy to use product that is clearly useful and cost effective. E-Mail was the key in our Office. Once the Auditor General was sold and started using it to call meetings and ask questions, you might say it became a career limiting move not to use your E-Mail. E-mail developed keyboarding and word processing skills and took the fear out of this strange new technology. Such extensive use of electronic presentation packages is made that skill with Harvard Graphics was seen to be a prerequisite to promotion.

Increased keyboarding by auditors has resulted in less typing by the clerical support staff. To help provide support to the audit teams and to make auditors at executive levels more comfortable in learning computer skills, the clerical support staff are being re-trained to support microcomputer use. A four month micro support apprenticeship program provides hands-on experience with computers and the software packages that are in most common use. For more than three years we have been graduating over ten staff a year.

The cost of providing auditors and support staff with both equipment and training are still significant because of the rapid increase in the capacity and capability of micro-

computers. As users require more advanced computers, their older machines are passed on to other staff. Machines that are not capable of running the current Office standard software are declared obsolete and disposed of.

J. The Future in the OAG

The Office is continuing to monitor the developments in auditing technology and in client systems.

Our reporting is also improving through the use of high quality video reports - to get the message to a segment of the population that would not normally read our reports and through some advanced desktop publishing techniques - to improve the quality of our printed reports. The text of our report is also issued in an electronic format.

Our strategy is shifting from "empowering the auditor" to "empowering the team". Now that the Office is fully networked, we are concentrating on groupware that allows the audit team to function as a unit - collaboration adds value. We are experimenting with teleconferencing to connect our regional offices and we have just implemented a data base of all approved Treasury Board submissions, with search capabilities, so any team can readily access these documents by topic or by department.

Our philosophy is to avoid being on the bleeding edge of technology, but rather to provide innovative applications of proven technology. The leading edge is quite enough, thank you, you can still bloody your fingers.

Tools for auditing will become more and more powerful. Where expertise is expensive and rare, expert systems will be developed. Computers will get smaller, and lighter, giving the auditor greater time-saving flexibility and enjoyment from the job.

VI. LOOKING AHEAD FOR THE PROFESSION

While the new paradigm for auditors is not yet totally clear, as I suggested when I started, it is at least starting to become clear.

Much of the technology which has been introduced in the audit profession has had the effect of automating operations which previously were done in a more labour intensive fashion. The word processing and spreadsheet programs we know and love must be included in this group.

So while the computer, like the printing press, is the technology which is driving change, it will be the application of new software and applications, like the changes in book binding two hundred years ago, which will allow our clients and ourselves as auditors to take advantage of it.

Our challenge as auditors will be to effect changes in methodology, the changes which the new technology permits, the changes which will redefine the role of our profession and our roles as practitioners. We must help our clients use information technology to fundamentally re-engineer their operational and administrative processes. In addition we must use information technology to fundamentally re-engineer our own audit and advisory functions. We will also do this to get a double benefit: productivity gains and better service to our clients. As an added bonus, we have found that most users enjoy a much higher level of job satisfaction.

The new environment leads us to a number of propositions for the future.

These propositions all call for re-engineering:

- re-engineering the audit process;
- re-engineering professional relationships;
- re-engineering audit results;
- re-engineering professional auditors;

A. Using the Horsepower - Re-engineering the Audit Process

The primary impact of technology will be to permit the re-engineering of the audit process to match the changes in the audit environment - demographic, economic, legal, environmentally conscious and quality focused. There are several approaches which will be used to do this.

1. Exploiting EDP Technology

The cost-effectiveness of EDP technology has sky rocketed in the past decade and will continue to do so. We must help exploit the opportunities of using technology to improve the level of service to our clients and to the public.

2. Improving Productivity through Better Systems - Re-engineering vs Replacement

We must encourage, among our clients as well as among ourselves, the re-engineering rather than the replacement of systems so that both we and our clients can take advantage of technology to streamline our operations in ways not possible in its absence.

Technology can improve our productivity, our value added contribution to our clients, the productivity of our clients and their value added contribution to their publics.

3. Audit Automation

As transaction volumes increase, the cost of audit increases, although not in proportion. As computer system capabilities increase, the opportunities for both audit cost reduction and audit quality improvements can increase if we consider auditing needs during system design.

4. Information as a Resource

If information has value, it is an asset and needs to be secure, readily accessible and up to date. As an increasing amount of information will exist only in an electronic form, both we and our clients will have to take increasing care to safeguard it. Our re-engineering must reflect that better management of information.

In that re-engineering, we must identify and conserve existing information, use technology to reduce data collection costs and, by analyzing processes, eliminate unnecessary data collection.

5. Towards A Paperless Society

The re-engineering of the audit process will be profoundly affected by a shift towards a paperless society.

Auditors have historically followed transactions along paper trails even when the primary transactions were made electronically. All of the above technical advances point to the increasing primacy of the electronic version over the paper version. Indeed, the paper version may not exist.

Increasingly, transactions exist only in electronic form, employing electronic signatures. The opportunities for reductions in monetary costs and environmental consequences are substantial. The task of auditing an electronic trail requires new audit approaches and re-training.

The reporting side of the paperless society involves re-engineering the audit media. For example, there is some provision for filing income tax returns electronically now and this practice is sure to spread. When will Securities Commissions and stock brokers want electronic financial statements and annual reports which they can add to their data bases for fast and easy retrieval?

6. Exploiting Other Technologies

If we look at the significance of the rapid developments in EDP technology in the context of these other environments, then our description of ourselves as EDP Auditors, while true, is inadequate. We are, or should be, in the broadest sense, TECHNOLOGY AUDITORS.

Let me give you an example. Our Office is responsible for the audit of the Exchange Fund Account where there were, when I took over the audit, 10 billion dollars worth of gold. Only limited physical tests had been done to determine that it was gold of the specified grade. The explanation given was that such a determination was too expensive because the only way to test gold bars was to melt them down. Being an engineer with a background in remote material analysis, I immediately suspected that other approaches were possible. In fact, we quickly found a testing machine that only cost \$20,000 and would quickly and cheaply perform the equivalent tests electronically.

One may think of other possibilities for Technology in audit. How do you give an opinion on a forestry company, one of whose major assets is a block of cutting rights? One might use remote sensing to provide some indication that the rights were or were not as valuable as set out in the financial statements. Is this the role of computer auditors? I think we have to broaden our horizons.

B. Getting Involved - Re-engineering Professional Relationships

The new audit environment and re-engineered audit processes will require that we re-engineer our professional relationships. A number of areas where that re-engineering will have effect are becoming clear.

1. Getting Involved with Your Client

We must come to terms with the possibility of a new role for auditors in system development and the potential for conflict between the traditional "hands-off" independence of the auditor and the need to affect system design and implementation to ensure auditability.

Auditors have had some bad experiences with the implementation of new systems which, on one hand, lacked adequate audit trails for transactions and the ability to maintain the integrity of data. On the other hand, some systems that were supposedly modified to meet audit requirements have failed to do so, leaving the auditor "out on a limb" for having tried to make a positive contribution to the client.

In this era of complex and almost paperless systems, connecting with each other within and across entity boundaries through electronic data interchange, with electronic signatures becoming increasing the only instruments of authorization, the risk from the first circumstance exceeds that from the second, frightening as it is, and auditors must now play a part in system development. The risks of loss of adequate control, loss of the audit trail and the compromise of data integrity are too great to accept professionally. In addition, the opportunity to ensure that adequate controls and audit trails to ensure data integrity are implemented when they can be implemented conveniently is too valuable to forego. The audit organization should then minimize its conflict by having the advice on system design and implementation come from different individuals from those who are responsible for the audit.

2. Changing the Structure of the Profession

There are some facets of the work of our profession which are at its heart and cannot easily be exercised by others. On the other hand, the increasing sophistication of systems will require increasing input from technology specialists who are not auditors. We, as auditors, will be tasked to ensure, on behalf of our clients, that optimal use is made of this mix of talent. To do so will mean increasing our understanding of technology and ensuring that technology specialists understand the business issues which are so central to an audit.

3. Partnerships - Co-operation and Sharing

Our clients and ourselves must recognize, as the Federal Treasury Board did in a recent publication, the need to "exploit the strengths of other organizations and establish profitable partnerships in order to enhance its services."

Within our Office, we have actively pursued partnerships with software and hardware vendors, participated in joint software development (such as IDEA) and actively pursued the sharing of data through our CD-ROM project.

The audit profession has already taken major steps in terms of such partnerships in respect to the re-engineering of audit methodology. Each of the organizations participating in this conference has developed and published methodology of value to all practitioners, not just their own memberships.

Our Office was pleased to be a part of the CICA study "Managing and Using Microcomputers" and plans to be a part of the next study on methods of data extraction. Our office also contributed to the IIA Systems Auditability and Control study and is currently incorporating it into our own methodology guides.

We are long past the point, in terms of serving our clients cost-effectively, to have the luxury of duplicating methodology. Where possible, we are incorporating these products into our methodology, making modifications only for the unique elements of our client and our practice.

C. The Control Environment - Re-engineering Audit Results

We must re-assess what are the most appropriate results of an audit and re-engineer our work to produce those results. Two areas where that re-engineering will be significant are redefining controls and the development of recommendations to reduce costs.

1. Redefining Controls

Observations on controls are at the heart and soul of audits.

One common challenge is made manifest in the federal government's package of administrative reforms known as PS2000. On one hand, the Government points out that managers are hamstrung by the large number of controls currently in place and which must be dealt with, with real costs of time and resources, in the implementation of any activity. On other hand, those controls were frequently implemented on the recommendations of auditors, external or internal, based upon real shortcomings of the previous management practice.

Technology permits us to design and implement controls which are not obtrusive in the day to day activities of managers and operations staff. For example, overloaded trucks cause significant damage to highways in Canada. The highway departments of some provinces have installed a type of monitoring device in the pavement to measure axle loads of trucks passing over it at highway speeds. Because the devices are buried in the asphalt of the traffic lanes, they are invisible to users of the road and thus cause no traffic slowdown. Compare the obtrusiveness of these installations to that of the weigh stations you see along the highways.

As auditors, we should be striving to develop unobtrusive controls like these wherever possible.

2. Recommendations to Produce Savings

As auditors, we may have been swayed too often and too much by the logic of our work over the cost impact of our recommendations.

Our recommendations must produce savings. While the audit function exists in part because it is legally mandated, our clients will expect, in addition to the exercise of that mandated function, a return on their investment in us.

The up-to-date auditor needs to become something of a consultant - not just reporting deficiencies, but looking for more efficient ways of doing things. Often, this will include technology.

D. Using Our People - Re-engineering Professional Auditors

The new environment will require that we retrain all our auditors.

1. Commitment of Senior Management

Our experience indicates strongly that the commitment of senior management is essential to the implementation of the scale of change which we are now seeing. The new breed of auditor is comfortable with technology. We must bring along decision makers, in both our own organizations and those of our clients, first into a fuller appreciation of this changed environment and then to a commitment to effective change.

2. EDP Literacy for Auditors

By the year 2000, all auditors will need to be knowledgeable in the use of computers. Indeed, a non-EDP auditor will be an anachronism by that time.

There will, however, continue to be a requirement for more and more specialization. As systems become more complex, some auditors must take on more and more sophisticated roles in their audits. So specialist auditors like yourselves will also be there and always be needed, even as the average auditor becomes more computer literate.

VII. CONCLUSION

I opened my talk by quoting Naisbitt. I'd like to close by paraphrasing him:

MY GOD - WHAT AN EXCITING TIME TO BE AN AUDITOR!

The next decade will indeed be an exciting one. I look forward to sharing the evolution of our profession together.

THANK YOU

**What a great time
to be an Auditor!**





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